

# The Accuracy of Prevalence Estimations for Suicide Attempts. How Reliably Do Adolescents and Young Adults Report Their Suicide Attempts?

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This study explores the accuracy of prevalence estimations for suicide attempts. Data came from the Early Developmental Stages of Psychopathology (EDSP) Study, a prospective community study (mean follow-up period was 42 months) of 3,021 respondents aged 14 to 24 years at the outset of the study. Suicide attempters are at least 1.6 times more likely to drop out than subjects with no suicide attempts and suicidal ideas. A total of 8% of all suicide attempters answered in the negative the depression-related gate questions of all surveys. One-third of all baseline suicide attempters did not report their suicide attempt again at the four years later assessment. In particular, 80% of all nonreporters were female, and almost 60% were aged 14–17 at baseline.

**Keywords** suicide attempt, adolescents, prevalence, accuracy

In recent years many studies have become available that examined the epidemiology of suicidal behavior and suggested that suicide attempts are a quite frequent phenomenon. The lifetime prevalence of suicide attempts in general population samples (aged 18 to 64) has been estimated in Western industrialized countries to range between 3.1% and 5.9%. Reported rates for suicidal ideation were even higher and ranged from 11.2% to 14.9% (Weissman, Bland, Canino et al., 1999).

There is also some evidence that such high rates can be found in adolescents and young adults as well. As part of the Early Developmental Stages of Psychopathology (EDSP) Study, Wunderlich, Bronisch, and Wittchen (1998a) reported lifetime prevalence of attempted suicide among adolescents and young adults aged 14–24 to be 2.3%.

But how reliable and accurate are those estimates? It should be noted that they are based on the respondents' „yes“ and „no“ answers to a fairly restricted range of standardized interview questions as part of the Diagnostic Interview Schedule (DIS: Robins, Cottler, Bucholz et al., 2000) or the Composite International Diagnostic Interview (CIDI: WHO, 1990). These questions are embedded in the depression modules of these instruments.

The accuracy of prevalence estimates may be limited also by selective nonparticipation of subjects with suicidal characteristics. This possibility is critical, especially for prevalence estimates that are based on cumulative follow-up incidence rates. As suicide attempts are assessed mainly by self-reports, additional problems derive from biases such as denial or re-interpreting, as well as recall biases of the person providing the data.

To our knowledge none of the studies Weissman, Bland, Canino et al. (1999) referred to provided evidence about the reliability and validity of prevalence estimates from community samples. Only few studies were identified that provide some limited information about the quality of self-report data related to suicidal behavior. Goldney, Smith, Winefield et al. (1991)

investigated young adults who finished school; four years after the index assessment, 40% of subjects who reported suicidal ideation at the baseline survey denied ever having had suicidal ideation during their lives. Statham, Heath, Madden et al. (1998) found a similar result by examining twins from an Australian twin panel. A total of 32% (women) to 44% (men) of those subjects who reported suicidal ideation when first surveyed in 1980–82 denied ever having experienced such thoughts at the 1992–93 follow-up interviews. Additionally, Brenner, Kann, McManus et al. (2002) investigated a sample of 4619 male and female high school students who completed the Youth Risk Behaviour Survey (YRBS) questionnaire of the Centers for Disease Control and Prevention (CDC) on two occasions approximately two weeks apart. The questionnaire assessed a broad range of health risk behavior including suicidality covering the last 12 months. The reliability (kappa values) for the items that assessed suicide attempts varied between 52.3 and 72.7, furthermore, for suicide ideation between 66.6 and 72.7.

In light of the limited data available, we decided to expand our search. The expansion included studies with: (1) more detailed assessments about the type and severity of the reported suicide attempt; (2) additional information about specific aspects of suicidal ideation; and (3) more information about the type of interview questions our present prevalence estimates are based on.

Despite the fact that such comparisons might be used as further sources for indirect validation and reliability appraisal, no such study was identified. To our knowledge no attempt had been made so far to determine the stability with which suicide attempters report suicide attempts over a longer time interval. This is underscored by the fact that suicide attempts are powerful predictors of further suicidal behavior (Bronisch, 1992).

There are additional evident problems in the assessment of suicide attempts by standardized diagnostic interviews such as the DIS and CIDI that warrant further caution. (1) Naturally, suicide attempts identified in epidemiological surveys frequently date back many years and thus are subject to recall bias. Furthermore, such retrospective self-report data can be affected by shame, reinterpretation, a lack of frankness and the severity of the suicide attempt itself. For example, Schaeffer (2000) reported that self-reports about threatening topics such as sexual intercourse and drug consumption are more susceptible than usual to errors caused by omission and other factors. Questions about the suicide attempts themselves also could be regarded as threatening and might lead to errors in the reliability of self-reports on suicide attempts. (2) We can assume that the context of assessment plays a critical role, not only, for instance, in terms of the respondent–interviewer relationship, but also in terms of the context in which the suicide questions are presented in the overall interview. For example, Barber, Marzuk, Leon et al. (2001), using a structured interview, first asked respondents from a clinical sample whether they had ever come close to committing suicide; the investigators then challenged the answers by a series of additional probing questions concerning the methods of the respondents' aborted suicide attempts. The researchers noted that 44.3% of respondents with a known history of aborted suicide attempts positively answered specific questions about their applied methods even though they had answered the general question in the negative. Kessler, Wittchen, Abelson et al. (2000) reported on a similar problem concerning stem questions in the Composite International Diagnostic Interview (CIDI). At the beginning of each specific section of the CIDI, stem questions ask for lifetime key symptoms of a particular sort. If these questions are answered in the negative, all further questions about the syndrome are skipped. The authors found that half of the respondents misinterpret these questions and do not take them as seriously as they should.

Furthermore, since it is well documented that suicide attempts are associated with other mental disorders (Bronisch & Wittchen, 1994), one might expect that a considerable proportion of suicide attempters negatively answer the gate questions about depression and consequently are never asked about suicide attempts.

This study aims to examine the accuracy and possible limitations of prevalence estimates for suicidal behavior by using prospective- longitudinal data from a large community survey (Early Developmental Study of Psychopathology Study (EDSP)), (Lieb, Isensee, von Sydow et al., 2000; Wittchen, Lachner, Wunderlich et al., 1998). We will:

- (1) calculate the five-year cumulative lifetime incidence rates for suicide attempts;
- (2) examine the frequency of potentially selective dropping out of suicide attempters at baseline;
- (3) study the effects of depression-related assessment of suicide attempts and;
- (4) explore the stability and consistency of self-reports of suicide attempts over the four-year follow-up period.

## **METHOD**

Data came from the Early Developmental Stages of Psychopathology (EDSP) Study, a prospective-longitudinal epidemiological study based on a representative community sample of adolescents and young adults living in the Munich area, aged 14–24 years at baseline. The overall aim of the study is to explore the prevalence, incidence, comorbidity, risk factors and the four-year course of mental disorders in a representative, general population sample. The EDSP is divided into three waves, extending from 1995 (T0) to 1999 (T2).

### **Sample**

The EDSP builds on a random population sample drawn from population registry offices of Munich and its surrounding counties in 1994. Details about the sampling procedure; representation of the sample, and socio-demographic characteristics of the subjects have already been reported by Wittchen, Lachner, Wunderlich et al. (1998) and Lieb, Isensee, von Sydow et al. (2000). Among the sampled subjects 3,021 interviews were completed at baseline (response rate: 71%). After 14 to 25 months the first follow-up survey was conducted for subjects aged 14–17; a total of 1,228 interviews were completed (response rate: 88%). The second follow-up survey was conducted for all subjects 34–50 months after baseline; it encompassed a total of 2,548 interviews (response rate: 84%).

### **Diagnostic Assessment**

Face to face, computer assisted interviews were administered by a highly experienced survey staff. This staff consisted of 57 clinical interviewers, most of whom were clinical psychologists, with extensive experience in diagnostic interviewing including the computer assisted version of the Munich-Composite International Diagnostic Interview (DIA-X/M-CIDI). The M-CIDI is an updated version of the World Health Organization's CIDI version 1.2 (WHO, 1990). The M-CIDI assesses 48 mental disorders by using DSM-IV (APA, 1994) and ICD-10 (WHO, 1991) criteria. The M-CIDI also assesses the beginning, duration and course of syndromes and the degree of clinical and psychosocial impairment. Reliability and procedural validity of the M-CIDI were tested in several studies. Detailed information is presented elsewhere (Reed, Gander, Pfister et al., 1998; Wittchen, Lachner, Wunderlich et al., 1998).

## **Assessment of Suicidal Ideation and Suicide Attempts**

The standard version of the M-CIDI assesses in the depression module suicide attempts and suicidal ideation by means of the following questions:

- (1) Has there ever been a period of 2 weeks or more when you thought a lot about death—either your own, someone else's, or death in general?
- (2) Has there been a period of 2 weeks or more when you felt like you wanted to die?
- (3) Have you ever felt so low that you thought about committing suicide?
- (4) Have you ever made a plan as how you might do it?
- (5) Have you ever attempted suicide?

It is important to note that in the standard M-CIDI, the only respondents who are asked these questions are those who had answered „yes“ to at least one of the three stem questions at the beginning of section E, which refers to core symptoms of major depression. At the second follow up, a modification was introduced into the depression module. To ensure that all subjects were asked additional questions about having attempted suicide in their lives, a skip to this question was introduced whenever all stem questions of major depression were answered negatively. This codification allowed us to examine the effect of asking suicide questions outside the depression section.

In order to elicit more detailed information about the suicide attempts, a self-rating questionnaire about methods and severity of suicide attempts (Wunderlich, Bronisch, & Wittchen, 1998b) was applied at T2. All respondents who had reported suicide attempts at one of the interviews had to answer this questionnaire. The questionnaire assessed the following topics: method applied; intention of the attempter to be discovered early or later on; degree of regret; risk of repeating the attempt; professional after-care; events that triggered the attempt; and possible changes in life after the suicide attempt.

## **Statistical Analysis**

Data were weighted to consider different sampling probabilities as well as systematic non-response at baseline. A detailed description of the sampling probabilities and of the EDSP weighting procedure is presented elsewhere (Lieb, Isensee, von Sydow et al., 2000; Wittchen, Lachner, Wunderlich et al., 1998).

All statistical analyses were conducted using the software package STATA (version 7.0). Logistic regression analyses were conducted in order to compare probabilities of occurrence of specific characteristics within different groups. All results are expressed in odd's ratios.

## **RESULTS**

### **Prevalence, Incidence, and Cumulative Lifetime Incidence of Suicide Attempts**

Table 1 shows frequencies of suicide attempts over all three waves. The first column shows the lifetime prevalence rates at baseline. The second column refers to follow-up incidences T0–T2. For calculating the cumulative lifetime incidence two analyses were conducted. The common procedure to calculate cumulative incidences takes into account only those subjects who have participated in all follow-up surveys. Consequently, some subjects are missed, that is, those who were identified as suicide attempters at baseline but did not participate in the

follow-up surveys. To ensure that all critical cases were taken into account regardless of whether they participated in the follow-up surveys, we conducted a second analysis, which included the nonparticipants that occurred after baseline. The results of both analyses are shown in the last two columns of Table 1.

Females reported more suicide attempts than males in the overall sample and in both age groups. The cumulative lifetime incidence rates (1. Analysis) differ significantly between females and males (3.5% vs. 1.8%; OR = 2.0; 95% CI: 1.1–3.5). At baseline, rates in females of both age groups were similar. However, compared to females aged 18–24, a higher follow-up incidence rate could be observed among younger females (1.5% vs. 0.8% OR = 0.6; 95% CI: 0.2–1.8), resulting in a higher cumulative lifetime incidence rate (1. Analysis) in females aged 14–17 when compared to females aged 18–24 at baseline (3.8% vs. 3.3%; OR = 0.9; 95% CI: 0.5–1.6).

A similar pattern emerges for males. At baseline, males aged 18–24 had a significantly higher lifetime prevalence rate than males aged 14–17 (2.0% vs. 0.5%; OR = 3.8; 95% CI: 1.2–12.0). But compared to the older males a higher incidence rate occurs at follow up for younger males (0.8% vs. 0.5%; OR = 0.6; 95% CI: 0.1–3.0), so that the cumulative lifetime incidence rate (1. Analysis) for males aged 14–17 approaches the rate of the older males (2.1% (old) vs. 1.1% (young); OR = 1.9; 95% CI: 0.7–5.3).

Regarding the rates it appears that, throughout the total sample and both gender and age groups, the cumulative lifetime incidence rates calculated by including the nonparticipants (second analysis) are higher than those calculated in the first analysis. These results provide initial evidence for dropout effects.

### **Frequency of Non-participants Among Subjects Who Had Attempted Suicide**

In order to examine in more detail whether nonparticipants are selective, we analyzed in a first step how many subjects with a record of suicide attempts at baseline did not participate again in one or both of the follow-up surveys of the EDSP. Figure 1 gives an overview of the nonparticipants over the follow-up period and the number of dropouts who were suicide attempters.

As can be seen from Figure 1, a total of 473 (88+138+247), baseline respondents dropped out between T0 and T2. At baseline, 69 (26+43) respondents with previous suicide attempts were identified, and 24 (4+6+14) of them did not participate at T2. That means a total of 33.8% (weighted) of all baseline suicide attempters became nonparticipants during the course of the study.

Among suicide attempters (suicide attempts reported at baseline), significantly higher rates of nonparticipants were found than among subjects without suicidal ideas and suicide attempts (33.8% vs. 15.2%; OR = 2.8; 95% CI: 1.6–4.9). The results indicate, with regard to the lower limit of the 95% confidence interval; the chance of dropping out for suicide attempters was at least 1.6 times higher than for subjects without suicide attempts and suicidal ideas.

Likewise, a trend toward higher rates of nonparticipants was found among subjects who had suicidal ideas (i.e., wish to die, suicide plans) when compared to subjects without suicidal thoughts and suicide attempts. A further analysis revealed that female and male suicide attempters were affected equally by nonparticipants (both by about 35%).

## **The Effect of Depression-related Assessment of Suicide Attempts**

Due to the structure of the M-CIDI, suicide attempts were assessed only in the context of major depression. Whenever respondents answer „no“ to all three stem questions for major depression, all further questions about depression symptoms— including those about suicidal ideas and attempts—are skipped. Therefore, subjects who answer „no“ to these stem questions are not asked about suicidal ideation and suicide attempts later in the interview. At the second follow-up survey, however, all respondents were asked whether they ever had attempted suicide at any time in their lives, irrespective of their answers to the stem questions. These data from the second follow-up allowed us to analyze to what degree the M-CIDI depression-related assessment of suicide attempts may affect the prevalence estimates.

Table 2 shows how many respondents negatively answered all depression-stem questions at baseline and at T1 and T2 but reported at least one suicide attempt to the lifetime question at T2.

A total of 11 (8.1%) out of 88 subjects with reported suicide attempts never answered „yes“ to at least one of the depression-stem questions. Males and females showed almost similar rates of suicide attempters (7.5% vs. 8.5%) who answered negatively all depression stem questions on all surveys. However, suicide attempters aged 14–17 at baseline were missed more often by depression-related assessment than suicide attempters aged 18–24 (16.0% vs. 4.4%). Especially among female suicide attempters, a much higher proportion of younger subjects (22.2%) than older subjects (2.9%) answered „no“ to all stem questions.

## **Stability of Self-reports Among Suicide Attempters**

Stabler reporting respondents were defined as subjects who reported a suicide attempt at T0 and reported it again in response to the lifetime question at T2. Therefore, instability was defined as reporting any suicide attempt at baseline but not again at T2.

Table 3 compares respondents who exhibited stabler reports with those who displayed unstable reports.

Forty-five of 69 suicide attempters at baseline could be interviewed again at T2. One third of those 45 suicide attempters did not report their suicide attempts again. Females comprised 80.6% of all nonreporters. A total of 59.4% of the unstably reporting subjects were aged 14–17 (at baseline).

Table 4 reports the associations between stability of self-report of suicide attempt and cumulative lifetime DSM-IV mental disorders. Single disorders were grouped into the main diagnostic classes. A disorder was diagnosed if the criteria of a disorder ever had been fulfilled at any time during the subject's life. Note that many respondents had more than one disorder.

Somatoform, depressive, and anxiety disorders were the most frequent disorders among stabler reporting subjects. Significantly more stable reporting subjects had any depressive disorder when compared with unstably reporting subjects (OR = 8.4; 95% CI: 1.1–61.5). Likewise, the probability of stable reporting was higher for subjects with any somatoform disorder (OR = 16.1; 95% CI: 1.5–173.2).

Taking into account the total number of diagnoses, stabler reporting subjects had more disorders (3.5 on average) than unstably reporting subjects (2.8 on average).

## DISCUSSION

To our knowledge, this is the first study that has examined prevalence estimates for suicide attempts with special regard to methodological limitations. The prospective-longitudinal design of the study allows the determination of follow-up incidences as well as the effects of nonparticipants, depression-related assessment of suicide attempts, and inconsistencies of self-reports.

As a limitation of the study, one should note that this study is a post-hoc analysis of suicidality data based on the EDSP Study, which has not been conducted with the purpose of examining suicidal behavior. Furthermore, the EDSP focuses on adolescents and young adults; therefore, we can draw general conclusions from our findings only for this age group.

Comparing the two analyses of cumulative incidences, initial evidence indicated selective nonparticipation of subjects who demonstrated previous suicidal behavior. A deeper analysis showed that significantly more subjects with reported suicide attempts (33.8%) dropped out than subjects without reported suicide attempts and suicidal ideas (15.2%). In conclusion, the dropouts have to be characterized as selective.

It is important to note that this difference in nonparticipation is not due to a higher mortality rate among suicide attempters, additionally, none of the subjects committed suicide during the study. One person died due to an accident; all other non-respondents either refused to participate or could not be traced again.

The results show that one-third of all suicide attempters did not report a suicide attempt again at T2. Females comprised 80.6% of suicide attempters who did not report their suicide attempt again. Likewise, subjects aged 14–17 constituted the majority (59.4%) of suicide attempters who did not report their suicide attempt again at T2.

Depression-related assessment of suicide attempts missed about 8% of all subjects who reported ever having attempted suicide in the past. In particular, compared with older suicide attempters a larger proportion of younger suicide attempters (16% vs. 4.4%) were missed by the depression stem questions with the high proportion of younger, female suicide attempters (22.2%).

Furthermore, it appears that the more disorders a subject has, the more consistently he=she reports. In particular, having depressive or somatoform disorders seems to significantly increase the probability of consistent reports.

Since we have not asked the respondents, we can only speculate about the true reasons for not reporting a suicide attempt. Some possible explanations are given below:

(1) As suicide attempts are deeply felt events, and as a number of studies have found that important and deeply felt events are remembered generally (e.g., Dehmel & Wittchen, 1994), suicide attempts should be remembered easily. As younger subjects have reported less reliably, their suicide attempts might have been less serious than those of older respondents as

well a less serious attempt might be reinterpreted easily as an accident, rather than a suicide attempt.

(2) The accuracy of memory, especially memory of one's own experiences, is dependent on one's momentary emotional state (Kihlstrom, Eich, Sandbrand et al., 2000). Given that subjects attempt suicide when they feel very bad, subjects who still feel bad at the time of the interview should be more likely to report their suicide attempts.

(3) The stability and consistency of self-reports might be affected as well by the differing contexts in which the assessment of suicide attempts were embedded. No special emphasis was given to the assessment of suicidality at the baseline survey. But at T2, all respondents were explicitly asked about suicide attempts. Thus, important cues may have been missing at T2; the lack of such cues could have made recall difficult.

As the results indicate, selective dropouts, depression-related assessment, and unreliable self-reports may lead to considerable underestimation of prevalence estimates of suicide attempts. Therefore, the prevalence estimates should be considered as conservative estimates.

Depression-related assessment seems to be the least serious source of uncertainty, as it causes only 8% of all suicide attempters to be missed. A more important problem is the unreliability of self-reports concerning suicide attempts. Therefore, a more sensitive and more detailed assessment of suicidality might be useful. However, a balance between more effort (time) and the benefit of more detailed interviewing must be found.

## CONCLUSION

Selective nonparticipation and unstable self-reporting considerably affect prevalence estimates for suicide attempts, while depression-related assessment results only in a small effect. Therefore, the prevalence estimates should be considered as conservative estimates. Further research must be conducted in order to determine the reasons for non-reporting.

**TABLE 1. Prevalence Rates of Suicide Attempts at Baseline, Follow-up Incidence Rates and Cumulative Lifetime Incidence Rates**

	Lifetime prevalence rate at T0		Incidence rate T0-T2 (3-4 years)		Cum. lifetime-incidence rates T2			
	(N = 3021)		(N = 2548)		1. Analysis		2. Analysis	
	N	%w	N	%w	N	%w	N	%w
Group by age at T0								
Male								
14-17	4	0.5	4	0.8	6	1.1	8	1.2
18-24	16	2.0	3	0.5	14	2.1	19	2.4
Total	20	1.5	7	0.6	20	1.8	27	2.0
Female								
14-17	22	3.2	8	1.5	22	3.8	30	4.5
18-24	27	3.1	5	0.8	23	3.3	32	3.8
Total	49	3.1	13	1.0	45	3.5	62	4.0
Total	69	2.3	20	0.8	65	2.6	89	3.0



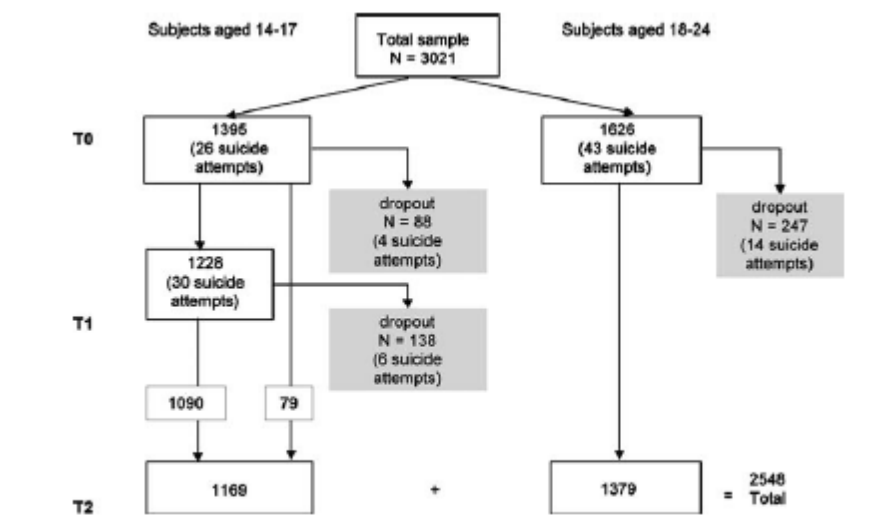


FIGURE 1. Participation and dropouts throughout all three surveys.

TABLE 2. Proportion of Suicide Attempters Who Answered "No" to All Depression Related Stem Questions

	Reported lifetime-suicide attempt at T2					
	"No" to all stem questions at T0, T1 and T2			"Yes" to at least one stem question at T0, T1 or T2		
	N	%w	95% CI	N	%w	95% CI
Male						
14-17	2	8.6	2.1-29.7	13	91.4	70.4-98.0
18-24	2	6.9	1.6-24.8	17	93.1	75.2-98.4
Total	4	7.5	2.7-19.2	30	92.5	80.8-97.3
Female						
14-17	6	22.2	9.6-43.4	20	77.8	56.6-90.4
18-24	1	2.9	0.4-17.9	27	97.1	82.1-99.6
Total	7	8.5	3.8-18.3	47	91.5	81.7-96.3
Total						
14-17	8	16.0	7.7-30.4	33	84.0	69.6-92.3
18-24	3	4.4	1.4-13.3	44	95.6	86.7-98.6
Total	11	8.0	4.3-14.8	77	91.9	85.2-95.7

TABLE 3. Stability of Self-reports of Suicide Attempts, Grouped by Age and Gender

	Suicide attempt at T0 <sup>1</sup>			
	Report at T2 (N = 30)		No report at T2 (N = 15)	
	N	w%	N	w%
Male	10	37.4	3	19.4
Female	20	62.6	12	80.6
14-17	6	9.8	10	59.4
18-24	24	90.3	5	40.6
Total	30	100.0	15	100.0

<sup>1</sup>Including subjects who participated at T2 only.

TABLE 4. Stability of Self-reports of Suicide Attempts in the Total Sample, Grouped by Cumulative Lifetime Diagnoses

DSM-IV diagnoses (cum. lifetime)	Suicide attempt at T0						Report vs. no report	
	Report at T2 (N = 30)			No report at T2 (N = 15)				
	N	%w	95% CI	N	%w	95%CI	OR <sup>1</sup>	95%CI
Any substance disorder	18	69.3	49.7–83.8	11	30.7	16.2–50.3	0.5	0.1–2.8
Any bipolar disorder	5	69.3	31.8–91.6	3	30.8	8.4–68.2	0.8	0.1–4.7
Any depressive disorder	24	84.2	67.5–93.2	7	15.8	6.8–32.5	8.3*	1.1–61.4
Any anxiety disorder	25	78.5	61.4–89.3	9	21.6	10.7–38.6	2.9	0.5–17.2
Any somatoform disorder	26	81.2	65.2–90.9	9	18.8	9.1–34.8	16.1*	1.5–173.1
Any eating disorder	5	66.7	30.2–90.3	3	33.3	9.7–69.8	0.7	0.1–3.8

<sup>1</sup> OR controlled for age and gender.

\*p < 0.05

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